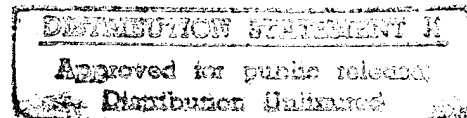


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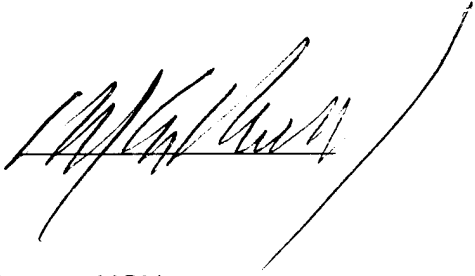
THE COAST GUARD  
SHIPBOARD COMMAND AND CONTROL SYSTEM  
AND ITS ROLE IN FUTURE JOINT MILITARY OPERATIONS

by  
Mike Raber  
LCDR, U. S. Coast Guard



A paper submitted to the faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: 

14 June 1996

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Faculty Advisor  
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Date

DTIC QUALITY INSPECTED 1

## REPORT DOCUMENTATION PAGE

1. Report Security Classification: UNCLASSIFIED			
2. Security Classification Authority:			
3. Declassification/Downgrading Schedule:			
4. Distribution/Availability of Report: DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.			
5. Name of Performing Organization: JOINT MILITARY OPERATIONS DEPARTMENT			
6. Office Symbol: NWC Code 1C		7. Address: NAVAL WAR COLLEGE 686 CUSHING ROAD NEWPORT, RI 02841-1207	
8. Title (Include Security Classification): THE COAST GUARD SHIPBOARD COMMAND AND CONTROL SYSTEM AND ITS ROLE IN FUTURE JOINT MILITARY OPERATIONS (U)			
9. Personal Authors: LCDR Michael E. Raber, USCG			
10. Type of Report: FINAL		11. Date of Report: 14 June 1996	
12. Page Count: 26			
13. Supplementary Notation: A paper submitted to the Faculty of the NWC in partial satisfaction of the requirements of the JMO Department. The contents of this paper reflect my own personal views and are not necessarily endorsed by the NWC or the Department of the Navy.			
14. Ten key words that relate to your paper: COMMAND, CONTROL, USCG, SCCS, JMCIS, GCCS, C3I, C4I, WHEC, NAVGUARD			
15. Abstract: Traditional peacetime Coast Guard missions involved only single ship operations and command and control (C2) issues were a low priority. Events throughout the 1980's, e.g., Mareil Cuban Boatlift, Exxon Valdez, and joint anti-drug operations, permanently altered the Service's view of improved C2 support systems. Political and economic forces drove the formation of the joint Navy-Coast Guard Board and the Permanent Joint Working Group (PJWG) for Cutter Combat Systems. A decade of PJWG efforts resulted in development of a Coast Guard C3I system known as the Shipboard Command and Control System (SCCS). Based on the Navy's standard afloat tactical information management system (NTCS-A), SCCS is fully compatible with JMCIS and the new joint C4I standard GCCS. SCCS proved highly effective during operational tests and actual usage. SCCS equipped cutters now have C2 capabilities comparable to the best the Navy currently has to offer. SCCS increases the Coast Guard's value when serving as part of a joint task force and gives Coast Guard units the C2 resources necessary to exercise tactical control over large, joint, multi-unit operations. SCCS improves mission performance throughout the spectrum of Coast Guard operations, including joint responses to traditional missions and joint operations involving armed conflict. Future system upgrades and compatibility with GCCS ensure SCCS will be a valuable C2 asset for many years to come.			
16. Distribution / Availability of Abstract:	Unclassified  X	Same As Rpt	DTIC Users
17. Abstract Security Classification: UNCLASSIFIED			
18. Name of Responsible Individual: CHAIRMAN, JOINT MILITARY OPERATIONS DEPARTMENT			
19. Telephone: 841- <del>666</del> 6461		20. Office Symbol: C	

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## SECTION I

### INTRODUCTION

History is replete with examples of military operations that were either helped or hindered by the effectiveness, or lack thereof, of command and control (C<sup>2</sup>). Good C<sup>2</sup> increases the chance of success, while inadequate C<sup>2</sup> can contribute directly towards defeat. Different services, with different equipment and doctrine, increase the potential for confusion. The complex nature of joint military operations makes effective C<sup>2</sup> particularly critical to success. At the same time, "jointness" can make C<sup>2</sup> effectiveness all the more difficult to achieve.

Except for those periods of war when the Coast Guard joined the Navy, most Coast Guard missions traditionally required only single ship operations. Whether setting buoys, performing search and rescue, or reporting weather data from an "ocean station," the issue of C<sup>2</sup> was never very high on the peacetime priority list. The 378' WHEC was introduced in the late 1960's and had a state of the art hull design and propulsion system. Unfortunately, communications and other combat-related electronics equipment were still WW II vintage.<sup>1</sup> Throughout the 1980's, Coast Guard operations would increasingly consist of large scale, joint service, multi-unit task forces. The rapidly changing nature of Coast Guard operations would permanently alter the Service's appreciation for C<sup>2</sup>.

During the 1980 Mariel Cuban Boatlift, more than 125,000 refugees escaped from Cuba and transited the straits of Florida. Over 100 Coast Guard cutters and patrol boats, and 14 Navy vessels, responded to this Castro-sanctioned crisis. In 1985, Coast Guard, Navy, and Customs vessels and aircraft combined forces in

what was until that time, the single largest joint drug interdiction effort (Operation Wagon Wheel).<sup>2</sup> Less than three years later, the Vice Presidential task force for the war on drugs institutionalized joint anti-drug cooperation by forming Joint Task Forces Four and Five. In response to the March 1989 grounding of the Exxon Valdez, the federal government activated the National Response Team, including DoD and 13 other federal agencies.<sup>3</sup> No longer exclusively in the Coast Guard domain, our national response to illegal aliens, illicit drugs, and environmental pollution was suddenly very large, very complex, and very joint.

Did Coast Guard strategy and policy planners recognize the significance of these dynamic changes and did they effectively respond to the looming C<sup>2</sup> crisis? In solving their own C<sup>2</sup> dilemma, did Coast Guard planners adequately account for trends towards increasing joint operations? Is there a C<sup>2</sup> solution for traditional peacetime missions that also provides relevance to joint military operations? I propose that the answer to all these questions is a resounding YES! While addressing these questions, my paper shifts between the terms C<sup>3</sup>, C<sup>3</sup>I, and C<sup>4</sup>I. My usage of these terms is consistent with the record material as well as the terminology in vogue at the time. The addition of communications (C<sup>3</sup>), then intelligence (C<sup>3</sup>I), and finally computers (C<sup>4</sup>I), reflects their evolving contributions to improved C<sup>2</sup>, but regardless of what you call them, they are all C<sup>2</sup> support systems.

## SECTION II

### THE EVOLUTION OF COAST GUARD C<sup>3</sup>I

Even as the Coast Guard's peacetime operating environment was becoming increasingly complex, cutters continued to rely on C<sup>2</sup> systems based on 20 - 50 year old technology. Slow, inaccurate, and personnel intensive, vertical plotting boards, dead reckoning tables, and radio teletypes hampered mission effectiveness.<sup>4</sup> Mutual politico-economic concerns, including the desire for a unified position "on the hill," lead the Chief of Naval Operations (CNO) and the Commandant of the Coast Guard to jointly form the Navy-Coast Guard (NavGuard) Board. The NavGuard Board would be a "vehicle for institutionalizing the relationship between the Navy and the Coast Guard." The initial meeting emphasized increasing joint operations and placed improved C<sup>2</sup> relationships and linkages high on the agenda.<sup>5</sup>

One of the primary objectives of the NavGuard Board was to provide joint input to the ongoing mid-life review for the Hamilton Class 378' WHEC. Relocating the Combat Information Center(CIC) from the O-3 deck to below the waterline would be a major part of the upcoming Fleet Renovation and Modernization (FRAM) overhaul. Recognizing the unique opportunity to increase service interoperability, an ad hoc working group researched the feasibility of replacing various combat-related electronics equipment with Navy systems. Included under C<sup>3</sup> system improvements, the Services agreed to install two-way satellite communications equipment (NAVMACS A+). Unfortunately, there was a flag level impasse regarding the need to upgrade the existing LINK-14 to LINK-11 (automated Tactical Data Links).<sup>6</sup>

Despite the high level attention, C<sup>3</sup> system improvements "kept falling out of the budget."<sup>7</sup> Budget problems, long procurement lead times, and philosophical differences all contributed to reinstalling the old equipment back in the 378' WHEC's post-FRAM CIC. Significant progress in the C<sup>3</sup> arena continued to elude the NavGuard Board. Since the "ad hoc" approach had not produced the desired results, a Permanent Joint Working Group on Cutter Combat Systems Equipment (PJWG) was established in December 1988.<sup>8</sup> The PJWG was an "important step in optimizing interoperability and supportability of the Coast Guard during wartime, or other occasions, when it operates as a Service in the Department of the Navy."<sup>9</sup>

Shortly after formation of the PJWG, the 1989 National Defense Authorization Act tasked the Secretary of Defense with integrating all anti-drug C<sup>3</sup> and intelligence assets.<sup>10</sup> Not surprisingly, C<sup>3</sup> advancements began to occur more rapidly. While contrasting their findings with the CNO's Top 20 warfighting improvements, the PJWG stated: ". . . the single most important issue for Coast Guard configuration must be interoperability. From a warfighting standpoint, if cutters are not interoperable with USN units, the benefits accrued by installation of other improvements is reduced significantly."<sup>11</sup> A Prototype version of the Navy Desktop Tactical Computer (DTC) with the Joint Operational Tactical System II (JOTS II) was installed on several cutters within the year. Using the JOTS II software, the DTCs formed an early version of the Naval Tactical Command System-Afloat(NTCS-A), the Navy's primary afloat C<sup>3</sup>I system.<sup>12</sup> Although ten additional cutters soon received the NTCS-A system, only two had prototype

installations of the external satellite communications data links required for full interoperability with the Navy.

Thirteen years after the NavGuard Board was tasked with improving C<sup>2</sup>, the Coast Guard finally had a C<sup>3</sup>I system of their own. Development of the Shipboard Command and Control System (SCCS) seemed slow, but the major cause of the delay was funding. The delay in SCCS funding occurred primarily because "the congressional oversight committee had to be convinced these systems were needed to improve all Coast Guard missions, not just defense related missions, before approving the budget line item."<sup>13</sup> On the other hand, while selling this major acquisition to Congress, Secretary Pena wrote: "The importance of SCCS and its direct contribution to successful operations and interoperability with DoD during joint operations cannot be overstated".<sup>14</sup>

### SECTION III

#### SHIPBOARD COMMAND AND CONTROL SYSTEM (SCCS)

SCCS is a C<sup>3</sup>I system that provides the afloat commander with real-time tactical and intelligence information. SCCS enhances tactical information management and decision support by automatically fusing a wide variety of sensor data and consolidating both air and ship traffic into a comprehensive visual picture. By improving the speed and quality of critical operational decisions, SCCS enables users to better perform every type of mission, including search and rescue, alien migrant interdiction, and drug and fisheries law enforcement operations.

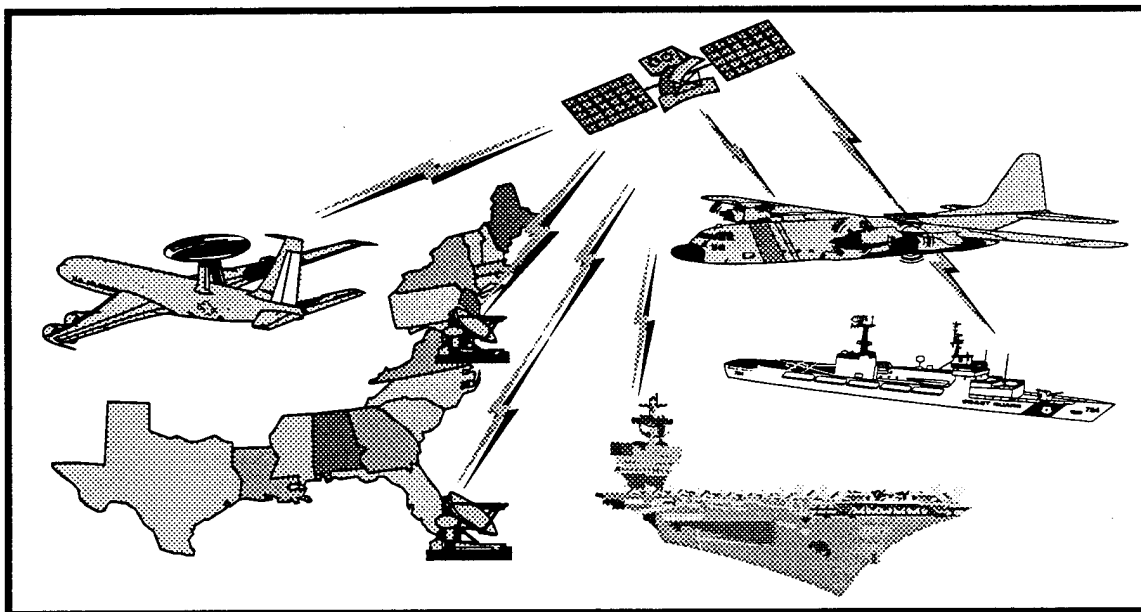


Figure 1. - Sharing the Tactical Picture

SCCS combines own ship and other ship, shore, and air inputs into a complete, accurate, up-to-date tactical picture. Vessel and aircraft tracks are automatically plotted on a world map or nautical chart, integrated with additional intelligence and tactical information, and presented on several large screen displays.

Users can manipulate the image and information in a manner that best suits their needs, such as viewing the entire theater or just the immediate vicinity. The "windows like" user interface is easy to learn and use. As shown below, each display screen is capable of simultaneously showing up to four different chart windows. This allows the user to view the local and worldwide tactical picture. The complete tactical picture is transmitted as a geographical plot and shared with other similarly equipped units. Flag-level oversight capability from Headquarters, Area, and District Operations Centers greatly improves the cutter's usefulness as a C<sup>2</sup> platform.

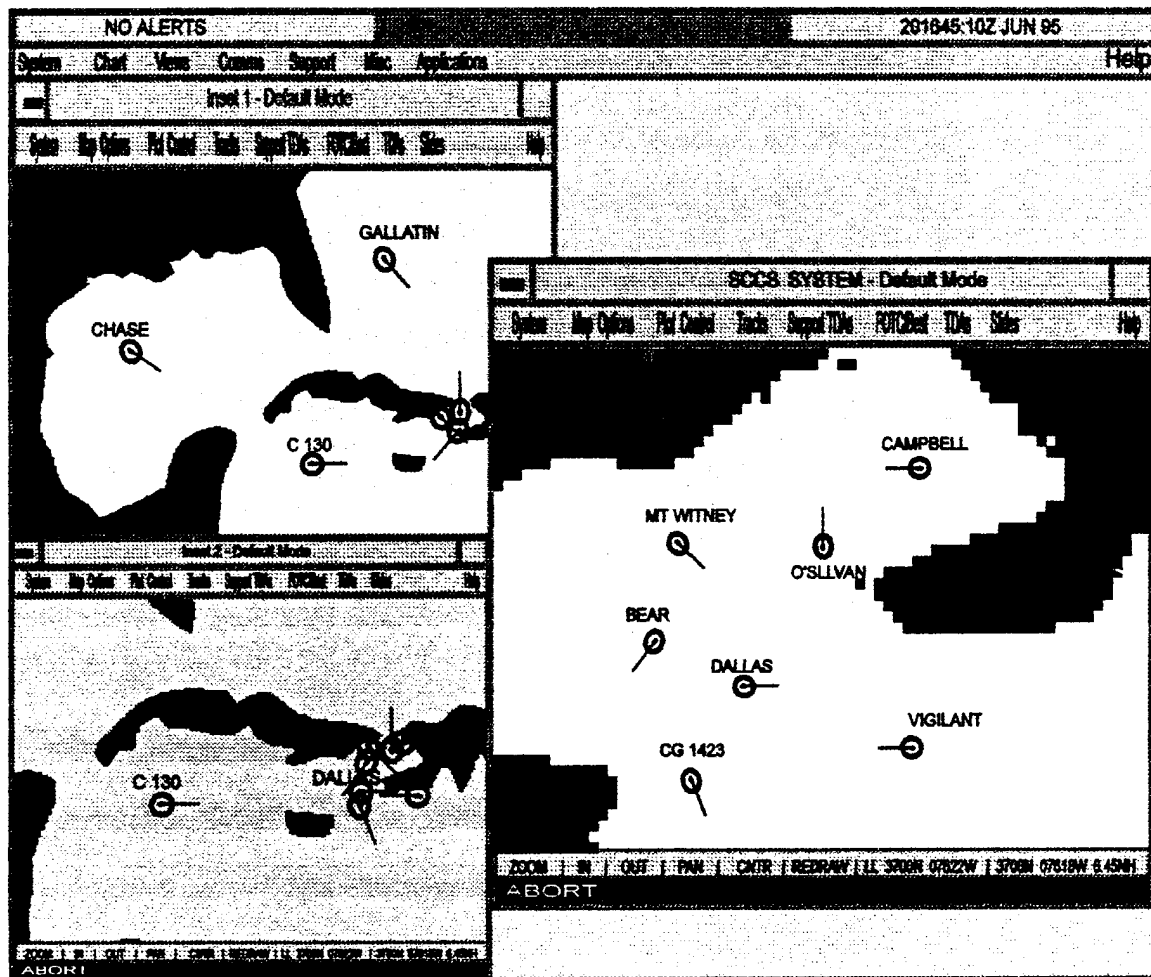


Figure 2. - Multiple Chart Windows

As discussed in the previous section, the PJWG considered joint interoperability essential throughout the SCCS development stage. As an NTCS-A based system, SCCS is completely interoperable with the Navy's primary afloat tactical information management system. Interoperability allows cutters at sea to take full advantage of the information resources available through DoD, including access to the fleetwide "common tactical picture" provided to NTCS-A equipped Navy ships.

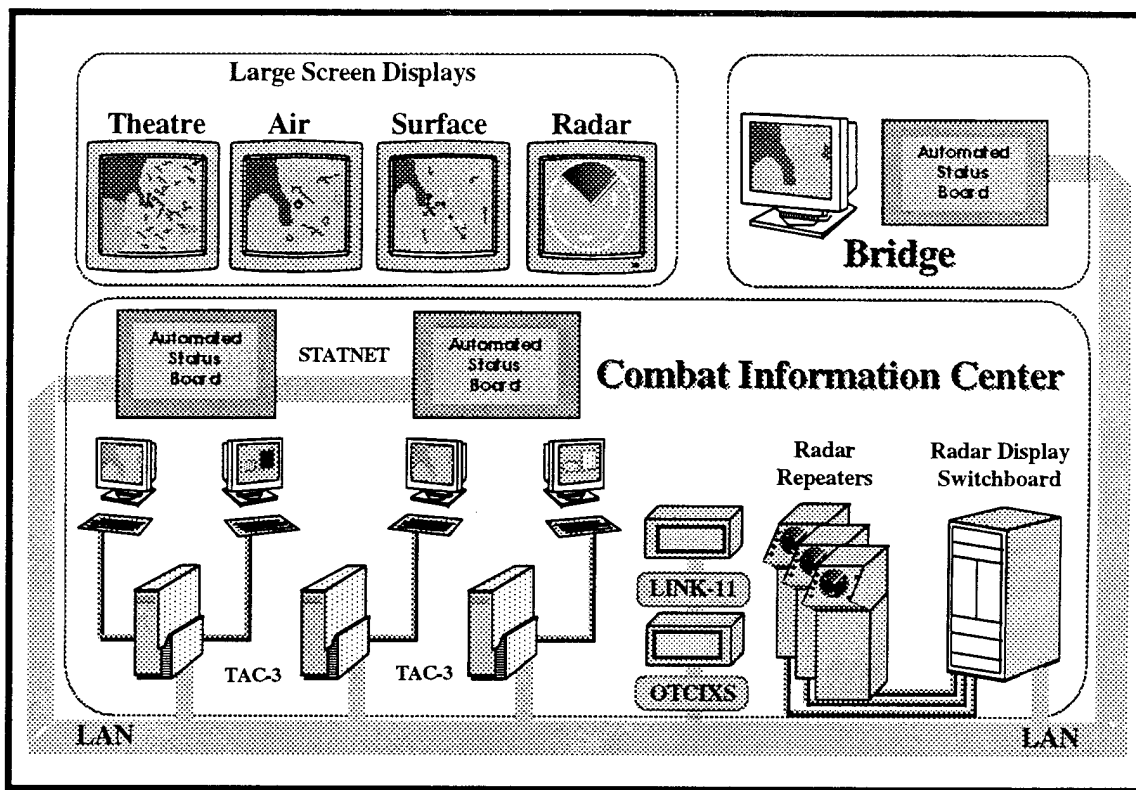


Figure 3. - Typical SCCS-378 (V3) Installation

There are three variants of SCCS found on the three largest cutter classes, designated SCCS-378, SCCS-270, and SCCS-210. The prototype system was referred to as the V1 configuration and the current production baseline is the V2.

The final baseline configuration for the 378' WHEC will be the V3. Three cutters have prototype versions of LINK-11 and the remainder of the 378' WHEC fleet will receive it when they get the V3 upgrade (see Section VI for further discussion of LINK-11). SCCS sounds quite complex, but it is actually analogous to the basic computer systems with which most of us are familiar. The core components are the central processing unit, application software, system inputs and outputs, and the visual displays.

**Central Processing Unit.** The brains behind SCCS is the Navy standard Tactical Advanced Computer 3 (TAC-3). Each shipboard installation includes three TAC-3 computers. The TAC-3 is a self-contained computer system and consists of a Hewlett-Packard CPU and operating system, keyboard, monitor, track ball, hard drives, RAM, CD-ROM drives, printers, etc.

**Application Software.** The application software, referred to as Unified Build (UB) software, is a combination of the Joint Operational Tactical System II (JOTS II), the Joint Visually Integrated Display System (JVIDS), and the Operational Support System (OSS). By integrating the afloat capabilities of JOTS II with the ashore capabilities of JVIDS and OSS, the UB software package provides dynamic C2 resources that support the entire spectrum of Coast Guard operations.

**System Inputs/Outputs.** SCCS combines, processes, and displays track and target information from numerous local and remote sensors. Sensor inputs include radar, satellite and radio communications links. All units with compatible systems use their own local data while simultaneously providing it to remote units.

At the same time, the unit receives and uses the external data provided by those remote units.

Local (Own Ship). Local inputs are obtained from various shipboard sensors, including surface search, air search, and fire control radars, the Global Positioning System, LORAN, gyro compass, and doppler speed log.

Remote (Other Ship/Air/Shore Units). Additional information, intelligence, and track and target data, such as vessel type, flag, course, speed, and position is exchanged with remote units operating within the tactical network. Data, classified text, graphics, and overlays are passed from one platform to another via the following communications and data links:

OTCIXS. The Officer in Tactical Command Information eXchange Sub-system (OTCIXS) is the Navy standard near-real time, two way, global, UHF secure satellite data communications link.

LINK-11. As the data link for Navy ships equipped with the Naval Tactical Data System (NTDS), this real time, two way data link passes information locally via either HF or UHF-LOS radio or globally via satellite.

Visual Displays. After processing vessel and aircraft tracks, overlays, and other data, the tactical computer displays the resulting information on large screen monitors and electronic status boards. The Status Network (STATNET) provides automated touch screen control of the visual displays.

## SECTION IV

### OPERATIONAL PERFORMANCE REVIEWS

Technological innovations frequently fail to deliver on the dramatic changes and improvements that they promise. Some of the fiercest battles in the military budget process have resulted from congress' perception that funds were wasted on complicated and unnecessary systems. SCCS is performing operationally better than expected and is a bona fide force multiplier. It also returns a significant dividend on the investment. In conjunction with ongoing streamlining efforts, the leveraging of technology will allow future reductions in shipboard manning levels.<sup>15</sup> SCCS will pay even greater dividends as it facilitates otherwise unattainable mission requirements.

From a system development standpoint, the prototype testing stage of SCCS offered everything one could hope for... and possibly more! Installation of the physical equipment on CGC DALLAS was rushed in preparation for the pending crisis in Haiti. Before the situation in Haiti had completely calmed, the ensuing Cuban exodus further challenged the capabilities of SCCS. SCCS proved its value and effectiveness very quickly during the mass Haitian migration when DALLAS served as On-Scene Commander (OSC). As OSC, DALLAS coordinated the efforts of dozens of ships and aircraft while interdicting and saving thousands of Haitians at sea. The improved ability of shore commands to provide support and oversight was equally important as the performance of the operational units. Operations Centers at the District, Area, and Headquarters had access to the identical tactical picture as

the OSC. Each level in the chain of command had the same information the cutter was using to manage the situation and could provide the necessary guidance.

DALLAS served as flagship for Commander, Task Unit (CTU) 44.7.4 during Operation Able Manner. In their post-action Lessons Learned message, the Commanding Officer remarked: "It appears that we in the Coast Guard have pushed the use of JOTS/NTCS-A well beyond what the Navy anticipated the systems could do. I think in many ways they are now looking to us for possible future uses and improvements that should be made."<sup>16</sup> In his endorsement to the Commandant, the Chief, Office of Law Enforcement and Defense Operations, wrote: "This package clearly delineates the capabilities of SCCS and demonstrates the necessity for this system to allow the 378' WHEC to properly perform as the command and control ship in any operation of this magnitude."<sup>17</sup>

CAPT J.H. Jones, Jr., a former graduate of the Naval War College and a former member of the CNO Strategic Studies Group, later assumed command of DALLAS. In addition to serving as flag ship for Operation Able Vigil and later as the CTU for Operation Able Manner, DALLAS participated in Operation Monsoon. Operation Monsoon was a joint counter-narcotics operation that directly targeted air drops of illegal drugs. In his After Action Report, CAPT Jones wrote:

The most stunning difference between this and other cutters I have served in is the Shipboard Command and Control System (SCCS). This system, with its ability to communicate real time information either verbally with the advanced communications suite or visually with OTCIXS and LINK-11, makes the 378' the perfect cutter for command of multi-unit operations. With the SCCS, DALLAS was able to provide a quick and informed response in every situation. During ABLE VIGIL, the CTU flag ships (DALLAS and GALLATIN) directed up to 50 vessels using the command and control system. In Operation Monsoon, DALLAS linked

with AEGIS, FFGs, and HAWKEYEs providing a real time picture for air contacts as they left Venezuela. In addition to real time tracking of an operation, the SCCS's capabilities also make it an excellent tool for operational planning. The ability to overlay patrol areas, search patterns, and DR tracks of contacts further enhanced our efficiency in running operations such as Able Vigil, Operation Monsoon, and Able Manner.<sup>18</sup>

SCCS proved its value during Operations Able Manner, Able Vigil, Uphold Democracy, and more routine counter-narcotics operations. The fleet is taking notice of the contributions of SCCS and its vital role in the C<sup>2</sup> of numerous operational successes. During a recent brief to the Commandant, it was stated that: "Several 378 skippers have said that they could not have served as on-scene coordinator for AMIO operations without SCCS."<sup>19</sup>

## **CHAPTER V**

### **SCCS' ROLE IN FUTURE JOINT MILITARY OPERATIONS**

The emphasis on SCCS joint interoperability ensured that the Coast Guard will continue to play a significant role in future joint military operations. In recent discussions during the NavGuard Board, VADM Reason cited the critical importance of maintaining a "continuum of interoperability" between the two Services. Maritime piracy, Operations Other Than War (OOTW) and protection of choke points and sea lines of communication were identified as reasons for increased Coast Guard involvement in worldwide defense operations.<sup>20</sup>

While not discounting the Coast Guard's historic contributions, recent events suggest that their biggest future impact will be much closer to home. Although Law Enforcement Detachments, based on Navy ships, performed many interdictions in the Persian Gulf, no cutters served in the war. Simultaneously however, the operational tempo in the Caribbean caused the number of on-scene Coast Guard assets to set all time records. Numerous factors suggest that this trend will continue.<sup>21</sup> Given the post-Cold War reduction in U.S. military forces around the globe, our nation's ability to respond to multiple contingencies elsewhere is increasingly dependent upon regional stability within Latin America. Latin America is unique for several reasons. First, it is in our own backyard. Second, the major security threat (illegal drugs) originates in the AOR of one CINC (SOUTHCOM) and transits through the AOR of another (USACOM). The ability to view the entire theater from a joint perspective makes SCCS equipped cutters the ideal full-time maritime interface between these "CINCdoms".

Although the increasingly sophisticated joint response to counter-narcotics often gets top billing, other regional threats (illegal immigration and insurgency) are of nearly equal concern. The U.S. Army Global Forecast, a service level threat assessment, suggested that Central America would be the most likely region for future trouble. The principal cause of this potential unrest is the combination of drug trafficking and the possibility of rekindled civil wars.<sup>22</sup> While fulfilling the Forward Presence mission envisioned in our National Security Strategy, SCCS equipped cutters would also facilitate rapid power projection during a crisis response. Carlos Vilas, a Central American analyst wrote: ". . . the drug trade requires control of airspace, customs, ports and airports, maritime routes and coasts - activities that in every country of the world are the responsibility of the armed forces or bodies under their control."<sup>23</sup> SCCS' ability to perform Force Over-The-Horizon Track Coordinator duties provides complete capability to deny drug smugglers control of all these resources.

The wisdom of choosing an NTCS-A based system will be more appreciated as additional joint C<sup>2</sup> systems become fully operational. NTCS-A served as the basis for the Navy's Joint Maritime Command Information System (JMCIS). JMCIS is the backbone of the joint service C<sup>4</sup>I system designated the Global Command and Control System (GCCS).<sup>24</sup> GCCS will provide interoperability among all the military service's C<sup>4</sup>I systems. It will give the joint forces commander a real-time, highly accurate picture of the entire battle space.<sup>25</sup> GCCS also achieved one of its first successes during the Haitian crisis. While still in the Proof-of-Concept stage, an early version of GCCS was installed in the USACOM Joint Operations Center. The

ACOM staff used GCCS to display both red and blue ground, sea, and air forces throughout the joint operating area on a single C<sup>2</sup> screen.<sup>26</sup>

With the Coast Guard's continuous presence in the Caribbean and the joint C<sup>2</sup> capabilities of SCCS, it is easy to envision an increased Coast Guard role in future joint military operations. The invasion of Grenada is an excellent example of a Caribbean operation where an increase in local knowledge and C<sup>2</sup> could have improved operational success. Coast Guard expertise and SCCS could provide both. An SCCS equipped cutter could be on-scene without delay. 378' WHEC's have quarters for an embarked Commander and a small staff and have previously served as flag ship for joint operations. Following Operation Able Manner, DALLAS' Commanding Officer wrote: "The Coast Guard is capable of exercising tactical control of USN and USMC units and using them to best advantage. A vital element of this was the command and control capabilities of a 378' WHEC."<sup>27</sup> Realistically speaking however, limited accommodations make service as the flag ship for most joint operations unlikely. A 378' WHEC could serve as an interim C<sup>2</sup> platform until a more suitable vessel arrived. The joint forces commander, located at either an afloat or ashore command center, would have immediate and seamless access to the entire theater-wide tactical picture.

## SECTION VI

### FUTURE C<sup>4</sup>I PLANS

The deterioration of Coast Guard warfighting capabilities after World War II reflected the fact that cutters had no serious capability to face the Soviet naval threat. Relegated to patrolling the Maritime Defense Zones, the lack of interoperability with our nation's forward deploying fighting forces was not a major issue. The end of the Cold War and subsequent changes in the national security environment has changed that. Current national security trends, including lesser scale contingencies (Haiti) suggest that the Coast Guard will have a more significant role in future joint military operations. Our peacetime missions will more closely resemble our commitment to defense. "In order to stay relevant in today's environment, the Coast Guard must have command and control capabilities without equal that easily interface with DoD, international, state, and federal entities."<sup>28</sup>

SCCS has proved its capabilities and operational benefits, but continued research and development is essential to prevent the system from becoming obsolete. As discussed in Section 3, several versions of LINK-11 were tested for the V3 configuration. The final version will use the jointly developed Advanced JMCIS Imbedded LINK-11 (AJILE).<sup>29</sup> The Coast Guard was the "prime mover" in developing a surface ship version of LINK-11 that is fully compliant with the JMCIS architecture.<sup>30</sup> The V3 upgrade for the 378' fleet will not be complete until the end of 1996. Future enhancements are under consideration even before the system is fully installed. The Navy currently intends to upgrade NTCS-A units with AJILE and is planning for a follow-on tactical data link (LINK-16). The NavGuard Board is already

studying the need to upgrade SCCS with LINK-16.<sup>31</sup> Although SCCS provides excellent tactical level (task force and sub-unit) support, increased access to GCCS at the strategic and operational levels (Headquarters Flag Plot and Area Operations Centers) is an essential C<sup>4</sup>I requirement.<sup>32</sup>

From its pre-FRAM origins to the final V3 installations, SCCS took nearly a decade to become a reality. Meanwhile, independent C<sup>2</sup> systems continue to proliferate throughout the Coast Guard and the other military services. This myriad of independent C<sup>2</sup> systems causes many problems, including tremendous development and acquisition costs, reduced joint interoperability, and increased training and maintenance demands. The Chairman of the JCS tackled this issue by requiring all future DoD C<sup>4</sup>I systems comply with the GCCS architecture.<sup>33</sup> In recognition of the joint C<sup>4</sup>I standard, the Commandant of the Coast Guard, in his 1995 Business Plan, also required that future C<sup>4</sup>I developments remain interoperable with GCCS.<sup>34</sup>

## **SECTION VII**

### **CONCLUSIONS**

The changing nature of post-Cold War security threats required a large scale, joint response to illegal immigration, drug smuggling, and environmental pollution. The lone cutter on patrol was suddenly an anomaly. Operational results quickly proved the need for improved interservice coordination. Coast Guard leaders responded to these dramatic changes and teamed up with the Navy to develop joint solutions. Rapidly evolving technology, budget problems, and politics all hampered progress, but the resulting C<sup>2</sup> system improvements were well worth the wait! SCCS was developed in a joint environment explicitly for the joint environment and is comparable to the best C<sup>4</sup>I system the Navy currently has to offer. SCCS has proved highly effective during complex multi-unit operations in support of joint drug and migrant interdiction efforts, but its usefulness during armed conflict remains untested. Given SCCS' strong organic capabilities and its compatibility with NTCS-A, JMCIS, and GCCS, it should undoubtedly be a valuable asset to the warfighting CINC. SCCS equipped cutters can fulfill the same role as a larger C<sup>2</sup> vessel but with a less threatening footprint. Highly capable for duty in war, tried and tested in times of peace, SCCS reaffirms the Coast Guard's viability as one of the five armed services.

## NOTES

<sup>1</sup> William L. Ross, "*Semper Paratus?* The Coast Guard Is Not Equipped to Fight," Naval War College Review, Winter 1990, pp.115-116.

<sup>2</sup> Robert J. Philpott, "C3 in Joint Interdiction Operations," Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1986, p.5.

<sup>3</sup> Robert Burns, "Military adjusts its role for era of violent peace," The Newport News Daily Press, 5 March 1990, p.A1.

<sup>4</sup> U.S. Coast Guard, 378-Foot Shipboard Command and Control System (SCCS), Acquisition, Construction, and Improvement Request (Washington: 1995), p.1.

<sup>5</sup> U.S. Navy Dept., Memorandum for the Record, Minutes of the Navy-Coast Guard Board, 24 September 1980, p.1.

<sup>6</sup> Minutes of the Navy-Coast Guard Board, 24 March 1981.

<sup>7</sup> Minutes of the Navy-Coast Guard Board, 21 April 1983, p.4.

<sup>8</sup> Minutes of the Navy-Coast Guard Board, 15 December 1988, p.1.

<sup>9</sup> Minutes of the Navy-Coast Guard Board, 27 February 1989, p.1.

<sup>10</sup> U.S. Joint Task Force Four, JTF-4 Counternarcotics Command Architecture, (Key West, FL: 1990), p.1-1.

<sup>11</sup> Minutes of the Navy-Coast Guard Board, 22 May 1989, Enclosure (1).

<sup>12</sup> Peter Rackham, ed., Jane's C4I Systems (Surrey, UK: Sentinel House, 1994), p.80.

<sup>13</sup> Minutes of the Navy-Coast Guard Board, 4 November 1993, p.1.

<sup>14</sup> Letter from Federico Pena, Secretary of Transportation, to Bob Carr, Chairman, Appropriations Subcommittee on Transportation and Related Agencies, 12 May 1993.

<sup>15</sup> Admiral Robert Kramek, Commandant of the U.S. Coast Guard, Address, U.S. Naval War College Lecture, Newport, RI: 24 October 1995.

<sup>16</sup> U.S. Coast Guard, Operation Able Manner Lessons Learned, Msg P300200Z April 1993, p.3.

<sup>17</sup> U.S. Coast Guard, Blue Digest from Chief, Office of Law Enforcement and Defense Operations to the Commandant of the Coast Guard, 25 May 1993.

<sup>18</sup> U.S. Coast Guard, USCGC DALLAS After Action Report, 11 November 1994, p.3.

<sup>19</sup> U.S. Coast Guard, SCCS Briefing Package, 3 August 1995, p.6.

<sup>20</sup> Minutes of the Navy-Coast Guard Board, 4 May 1995.

<sup>21</sup> Bruce Stubbs, The U.S. Coast Guard's National Security Role in the Twenty First Century, (Newport, RI: Naval War College Press, 1992), p.157.

<sup>22</sup> John E. Peters, The U.S. Military: Ready for the New World Order? (Westport, CT: Greenwood Press, 1993), pp.11-12.

<sup>23</sup> Shafik J. Handel and Carlos M. Vilas, The Socialist Option in Central America: Two Reassessments (New York: Monthly Review Press, 1993), p.81.

<sup>24</sup> "Leading the Revolution in C4I," Joint Force Quarterly, Autumn 1995, pp.15-16.

<sup>25</sup> "Global Command and Control System: From Concept to Reality", C4I for the Warrior, 12 June 1994, p.1.

<sup>26</sup> "Global Command and Control System," p.15.

<sup>27</sup> Msg P300200Z April 1993, p.1.

<sup>28</sup> U.S. Coast Guard, USCGC DALLAS After Action Report, 30 April 1993, p.3.

<sup>29</sup> U.S. Coast Guard, C4I Baseline Architecture, Comdt(G-OTT) Report, 5 January 1996, p.2-33.

<sup>30</sup> "Coast Guard Cutters Join Navy's C2 Net," Sea Power, August 1995, p.35.

<sup>31</sup> U.S. Navy Dept., PJWG Equipment Matrix, Report from the Permanent Joint Working Group on Cutter Combat Systems, 4 October 1995, p.1.

<sup>32</sup> C4I Baseline Architecture, p.10-2.

<sup>33</sup> "Global Command and Control System," p.18.

<sup>34</sup> C4I Baseline Architecture, p.10-41.

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